

forming an amplitude modulated signal by modulating the first RF signal with the second RF signal, wherein the amplitude modulated signal contains peaks with amplitudes greater than or less than amplitudes of peaks of the first RF signal; and delivering only the amplitude modulated signal to a reactant gas within the plasma processing chamber to form a plasma.

15. The method of claim 14 further comprising, prior to generating the plasma:

amplifying the amplitude modulated signal to form a high power amplitude modulated power signal, and wherein delivering plasma within the plasma processing chamber using the amplitude modulated signal comprises using the high power amplitude modulated signal to generate the plasma.

16. The method of claim 14 wherein the second RF signal has a lower frequency than the first RF signal.

17. The method of claim 14 wherein forming an amplitude modulated signal comprises:
forming an amplitude and frequency modulated RF signal with the second RF signal and a third frequency modulating RF signal.

18. The method of claim 14 further comprising:
modifying the amplitude modulated signal by adjusting a modulation index.

19. The method of claim 14 wherein the second RF signal comprises a signal of form $\beta \sin(\omega_m t)$, wherein β is a modulation index and is less than or equal to 1, ω_m is the modulating frequency, and t is time.

20. The method of claim 14 wherein the amplitude modulated signal is of the form $E_0[1 + \beta \sin(\omega_m t)] \sin(\omega_c t)$ wherein β is a modulation index, ω_m is the modulating frequency, ω_c is the modulation, E_0 is an initial electric field, and t is time.

21. The method of claim 14 further comprising passing the amplitude modulated signal through an impedance matching network.

1 22. The method of claim 14 wherein second RF signal is in the form of
2 a sine wave.

1 23. A method of delivering radio frequency (RF) power to a plasma,
2 the method comprising:
3 generating a first RF signal at a carrier frequency;
4 generating a second RF signal at a modulation frequency;
5 forming a frequency modulated signal by modulating the first RF signal
6 with the second RF signal; and
7 generating a plasma within the plasma processing chamber using the
8 frequency modulated signal.

1 24. The method of claim 23 further comprising:
2 amplifying the frequency modulated signal to generate a frequency
3 modulated power signal, and
4 wherein generating a plasma comprises using the frequency modulated
5 power signal to generate a plasma.

1 25. The method of claim 23 wherein forming the frequency modulated
2 signal comprises:

3 forming a frequency and amplitude modulated signal by modulating the
4 first RF signal with the second RF signal, and a third amplitude modulating signal.

1 26. The method of claim 23 wherein the modulation frequency is less
2 than about 0.1 times the carrier frequency.

1 27. The method of claim 23 wherein the frequency modulated power
2 signal is of the form $E(\omega_c, t) = E_0[\exp(i\omega_c t)] \exp[i\beta \sin(\omega_m t)]$.

1 28. The method of claim 23 wherein the carrier frequency is 13.56
2 MHz.

1 29. The method of claim 23 further comprising passing the frequency
2 modulated signal through an impedance matching network.

1 30. The method of claim 23 wherein the second RF signal is in the
2 form of a sine wave.

1 31. A power system for a plasma processing apparatus, the power
2 system comprising:
3 a single carrier source adapted to generate a first RF signal at a carrier
4 frequency;
5 a modulation source adapted to generate a second RF signal at a
6 modulation frequency; and
7 a modulator adapted to modulate the first RF signal with the second RF
8 signal to form an amplitude modulated signal, wherein the amplitude modulated signal
9 contains peaks with amplitudes greater than or less than amplitudes of the peaks of the
10 first RF signal.

1 32. A power system for a plasma processing apparatus, the power
2 system comprising:
3 a carrier source adapted to generate a first RF signal at a carrier frequency;
4 a modulation source adapted to generate a second RF signal at a
5 modulation frequency; and
6 a modulator adapted to modulate the first RF signal with the second RF
7 signal to form a frequency modulated signal.